

Working While Ill as a Risk Factor for Serious Coronary Events: The Whitehall II Study

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Absence from work because of sickness, or “sickness absenteeism,” is increasingly recognized as a measure of ill health.^{1–4} Studies on disease end points have shown that increased rates of medically certified periods of absence (long-term absences) predict increased rates of all-cause and cause-specific mortality, including cardiovascular death.^{1,3,4} This implies that medically certified absence is a measure of ill health. For self-certified (short-term) sickness absenteeism, similar associations have not been observed. A recent report from the Whitehall II study on overall mortality suggested a slightly higher mortality risk among employees with no such absence from work than among those with moderate absence.³

Findings on self-certified absence raise the possibility that some people, although sick, bring themselves to work and record no absences, a phenomenon called “sickness presenteeism.”^{5–7} Such behavior is hypothesized to be detrimental to health in the long run.⁸ Absence provides scope for recovery for ill and distressed employees, whereas presenteeism could produce a cumulative stress burden, a risk factor for coronary heart disease.⁹ However, no empirical data have been available to test this hypothesis.

This study from the Whitehall II cohort examined associations between sickness absenteeism and incidence of serious coronary events, as indicated by first nonfatal myocardial infarction and fatal coronary heart disease. To examine the effects of sickness presenteeism, we stratified our analyses by health status. Among those healthy at baseline, we expected the incidence of serious coronary events to increase as the absence rate increased. Among those unhealthy at baseline, we expected to see a U-shaped association, with a higher incidence among employees with no absence than among those with moderate absence. This is because sickness presenteeism is most likely in an unhealthy group

Objectives. Although sick, some people take no time off work, a phenomenon called “sickness presenteeism.” This study examined the association between sickness presenteeism and incidence of serious coronary events.

Methods. The analyses were based on a cohort of 5071 male British civil servants without previous myocardial infarction. Baseline screening included measurements of health status and coronary risk factors. Absence records were assessed for the 3 years subsequent to baseline screening. The outcome of interest was incident nonfatal myocardial infarction or fatal coronary heart disease (mean length of follow-up=9.1 years).

Results. Seventeen percent of unhealthy employees took no absence during the 3-year follow-up. Their incidence of serious coronary events was twice as high as that of the unhealthy employees with moderate levels of sickness absenteeism (after adjustment for conventional risk factors, hazard ratio 1.97, 95% confidence interval=1.02, 3.83).

Conclusions. Employers and employees should be aware of the potential harmful effects caused by sickness presenteeism. (*Am J Public Health.* 2005;95:98–102. doi: 10.2105/AJPH.2003.035873)

with no absences. High rates of absence, as a marker of serious health problems,³ would be associated with a high incidence of coronary events.

METHODS

Participants

The target population for Whitehall II was all London-based office staff, aged 35 to 55, working in 20 Civil Service departments. With a response rate of 73%, the final cohort consisted of 10 308: 6895 men and 3413 women.¹⁰ The true response rate was higher, however, because around 4% of those invited were not eligible for inclusion. This study is focused on 5071 men whose available records on sickness absenteeism extended for a minimum of 3 years after baseline screening and who had no myocardial infarction before or during the assessment of sickness absenteeism. Compared with excluded male civil servants, participants had a lower prevalence of coronary heart disease and a more favorable risk profile, as indicated by younger age, less hypertension, lower body mass index and cholesterol concentration, and employment in

higher-grade jobs with higher job control and lower effort-reward imbalance (for all differences, $P<.05$). We restricted analyses to men only, since the number of serious incident coronary events among women was insufficient during the follow-up period ($n=52$).

Baseline Health and Sickness Absenteeism

Baseline screening was carried out between 1985 and 1988. Health at baseline was defined by self-rated health status and psychological distress score from the 30-item General Health Questionnaire (GHQ). Unhealthy men were those whose self-rated health status was average or worse, who had a GHQ score above 4 (as previously validated),¹¹ or both ($n=1900$). Healthy men were those who rated their health as good or very good and scored 4 or less on the GHQ ($n=3134$).

Computerized sickness absenteeism records for the 3 years subsequent to the baseline screening were obtained from civil service pay centers.¹² These records included the first and last dates of all absences. For absences longer than 7 days, a medical certifi-

cate was required to explain the absence. For absences of 7 days or less, civil servants were able to complete their own certificate. Sickness absenteeism records were checked for inconsistencies. Overlapping, consecutive, or duplicate periods of sickness absenteeism were merged after weekends and public holidays were taken into account.

To construct 3 commonly used indicators of sickness absenteeism, we calculated the total number of days of absence, the number of medically certified absence periods (>7 days), and the number of self-certified absence periods (1–7 days), for each participant during the 3-year recording period. In each absence indicator, participants were divided into 3 groups according to their level of absence (0, >0–14, and >14 sick days per year; 0, >0–0.5, and >0.5 medically certified periods per year; and 0, >0–1.0, and >1.0 self-certified periods per year). In this study, unhealthy men with no sickness absenteeism denotes sickness presenteeism.

Incidence of Serious Coronary Events

A serious-incident coronary event was defined as a first nonfatal myocardial infarction or fatal coronary heart disease occurring after the 3-year sickness absenteeism recording period and before the end of 1999. To assess fatal coronary heart disease, participants were flagged at the National Health Service Central Registry, which provided information on the date and cause of death (of the 10 308 employees in the Whitehall II cohort, 10 300 were successfully flagged). Coronary death was defined by codes 410 through 414 of the *International Classification of Diseases, Ninth Revision*.¹³ Potential new cases of nonfatal myocardial infarction were ascertained by questionnaire items on chest pain¹⁴ and employee's recall of a doctor's diagnosis. Confirmation of myocardial infarction according to MONICA¹⁵ criteria was based on electrocardiograms, markers of myocardial necrosis, and chest pain history from the clinical records.

Covariates

Baseline screening included measurements on the following demographic characteristics and coronary risk factors: age (mean=43.9 years, SD=5.9, n=5071), employment grade (administrative, n=1971; professional/

executive, n=2687; clerical/support, n=413), hypertension (antihypertensive medication or systolic/diastolic blood pressure>160/95 mm Hg, n=358; others, n=4713), body mass index (mean=24.5 kg/m², SD=3.0, n=5061), serum cholesterol concentration (mean=5.95 mmol/L, SD=1.13, n=5055), smoking (current smoker, n=716; others, n=4229), heavy drinking (average consumption>21 units of absolute alcohol per week, n=944; ≤21 units, n=4090), type A behavior pattern (high, n=1668; others, n=3404), job demands (high, n=1565; others, n=3506), job control (low, n=1652; others, n=3397), and effort-reward imbalance (high, n=1621; others, n=3450).^{10,16,17} Prevalent coronary heart disease (not myocardial infarction) was determined on the basis of self-reports and confirmed by clinical records (145 cases, 4926 noncases).¹⁷

Data Analysis

We fitted Cox proportional-hazard models to study the association between sickness absenteeism and incidence of serious coronary events, both for all employees and separately for baseline unhealthy and healthy employees. Employees were censored at the time of the first serious coronary event or at study end. The group with no sickness absenteeism was the reference category for comparisons of these associations between the different indices of absence (number of sickness absenteeism days, periods of medically certified absence, periods of self-certified absence). For studying increased risk in unhealthy participants with no absence, the reference category was the moderate absence group. Hazard ratios and their 95% confidence intervals were adjusted for age, employment grade, coronary risk factors, and status of coronary heart disease at baseline. In the adjustments, body mass index, cholesterol concentration, and psychosocial risk factors were treated as continuous variables and other covariates as categorical variables. A quadratic term was entered into the model to test for a curvilinear trend across the levels of sickness absenteeism.

To study time dependence in the association between absence and incidence of coronary events, we split the follow-up period into 2 halves (incidence during the first 5 years of follow-up and incidence after this period) and

entered into the model an interaction term, time × sickness absenteeism, as a time-dependent covariate. To examine whether increased incidence of serious coronary events among unhealthy participants with no absence was dependent on cutpoints defining the reference group (moderate absence), we replicated the analysis by using an alternative categorization of sickness absenteeism. Finally, to check whether the presence of unobserved heterogeneity (frailty) might have an impact on results, we repeated analyses by fitting models with a gamma frailty distribution. The estimated variance of the frailties was not significantly different from zero, and estimated hazard ratios were very little changed.

The frailty analysis was performed with Stata 8.2 (Stata Corp, College Station, Tex). All the other analyses were performed with the SAS 8.2 program (SAS Institute Inc, Cary, NC).

RESULTS

Table 1 presents the associations between indices of sickness absenteeism and incidence of serious coronary events. For sickness absenteeism measured as numbers of days or as numbers of medically certified periods, the age-adjusted and employment grade-adjusted hazard ratios for high absence compared with no absence were statistically significant (1.9 and 1.8, respectively). After additional adjustments for coronary risk factors (fully adjusted models), the hazard ratios were attenuated and not statistically significant. Irrespective of adjustments, no association was found between self-certified absence and incidence of serious coronary events. Removal of men with prevalent coronary heart disease (not myocardial infarction) had little effect on these associations.

Table 2 shows the association between sickness absenteeism days and incidence of serious coronary events by baseline health. The interaction between baseline health and sickness absenteeism days was statistically significant (*P* for interaction term<.01 in a model containing main effects, age, and employment grade). For healthy participants, an increasing level of absence days was associated with increasing incidence of serious coronary events, whereas for unhealthy participants this association was U-shaped (*P* for

TABLE 1—Association Between Indices of Sickness Absenteeism and Incidence of Nonfatal Myocardial Infarction or Fatal Coronary Heart Disease: The Whitehall II Study

Index of Sickness Absenteeism ^a	No. Men (No. Serious Coronary Events)	Adjusted Hazard Ratio ^b (95% CI), Adjusted for—		
		Age and Employment Grade (A)	A + Biological and Behavioral Risk Factors ^c (B)	A + B + Psychosocial Risk Factors ^d
Days absent owing to sickness per year				
0	1102 (27)	1.00	1.00	1.00
>0–14	3205 (80)	1.00 (0.64, 1.57)	0.91 (0.58, 1.43)	0.96 (0.61, 1.51)
>14	439 (21)	1.85 (1.02, 3.36)	1.45 (0.80, 2.65)	1.62 (0.88, 2.99)
Medically certified absence periods per year				
0	3714 (91)	1.00	1.00	1.00
>0–0.5	714 (22)	1.22 (0.76, 1.94)	1.16 (0.73, 1.85)	1.18 (0.74, 1.89)
>0.5	318 (15)	1.82 (1.04, 3.20)	1.58 (0.89, 2.80)	1.65 (0.93, 2.94)
Self-certified absence periods per year				
0	1222 (32)	1.00	1.00	1.00
>0–1.0	1804 (45)	0.94 (0.60, 1.49)	0.88 (0.56, 1.39)	0.93 (0.58, 1.47)
>1.0	1720 (51)	1.09 (0.68, 1.73)	0.96 (0.60, 1.55)	1.02 (0.63, 1.64)

Note. CI = confidence interval. Only participants with no missing data in any of the predictors were included in these models.

^aBased on absence assessed for the 3 years subsequent to screening of health status and coronary risk factors.

^bFor incidence of serious coronary events after the period of recording sickness absenteeism (mean length of follow-up = 9.1 years).

^cIn addition to age and employment grade, hazard ratios are adjusted for hypertension, cholesterol, body mass index, smoking, heavy drinking, and coronary heart disease (other than myocardial infarction) at baseline.

^dIn addition to age, employment grade, and biological and behavioral risk factors, hazard ratios are adjusted for type A behavior, job demands, job control, and effort-reward imbalance at baseline.

TABLE 2—Association Between Sickness Absence Days and Incidence of Nonfatal Myocardial Infarction or Fatal Coronary Heart Disease by Baseline Health Status: The Whitehall II Study

Subpopulation	Days Absent per Year ^a	No. Men (No. Serious Coronary Events)	Adjusted Hazard Ratio ^b (95% CI), Adjusted for—		
			Age and Employment Grade (A)	A + Biological and Behavioral Risk Factors ^c (B)	A + B + Psychosocial Risk Factors ^d
Healthy men ^e	0	784 (13)	1.00	1.00	1.00
	>0–14	1946 (47)	1.46 (0.78, 2.72)	1.37 (0.73, 2.57)	1.51 (0.80, 2.85)
	>14	206 (6)	1.94 (0.72, 5.25)	1.59 (0.59, 4.29)	1.88 (0.68, 5.19)
Unhealthy men ^f	0 ^g	305 (14)	1.91 (0.99, 3.67)	2.01 (1.04, 3.89)	1.97 (1.02, 3.83)
	>0–14	1238 (33)	1.00	1.00	1.00
	>14	232 (15)	2.06 (1.10, 3.87)	1.72 (0.90, 3.29)	1.71 (0.89, 3.27)
Test of curvilinear trend			(<i>P</i> = .008)	(<i>P</i> = .018)	(<i>P</i> = .020)

Note. CI = confidence interval. Only participants with no missing data in any of the predictors were included in these models. Reference category is no absence for healthy men and moderate absence (>0–14 days per year) for unhealthy men.

^aBased on absence assessed for the 3 years subsequent to screening of health status and coronary risk factors.

^bFor incidence of serious coronary events after the period of recording sickness absenteeism (mean length of follow-up = 9.1 years).

^cIn addition to age and employment grade, hazard ratios are adjusted for hypertension, cholesterol, body mass index, smoking, heavy drinking, and coronary heart disease (other than myocardial infarction) at baseline.

^dIn addition to age, employment grade, and biological and behavioral risk factors, hazard ratios are adjusted for type A behavior, job demands, job control, and effort-reward imbalance at baseline.

^eAs indicated by not having poor self-rated health nor scoring above 4 on the General Health Questionnaire.

^fAs indicated by poor self-rated health or a score of over 4 on the General Health Questionnaire.

^gThis group (unhealthy men with no sickness absenteeism) denotes sickness presenteeism.

quadratic term = .02 in a fully adjusted model). Among unhealthy participants, fully adjusted hazard ratios for no absence and

high absence compared with moderate absence were 1.97 and 1.71, respectively. This U-shape trend was not dependent on the time

lag between assessment of absence and incidence of serious coronary events (*P* for time-dependent covariate = .90). Using unhealthy

men whose annual sick days ranged from more than 0 to 7 as the reference group did not abolish the excess risk of serious coronary events among unhealthy men with no absence (fully adjusted hazard ratio=1.99; 95% CI=1.0, 3.9).

For self-certified absence periods, a corresponding interaction with baseline health ($P<.01$) and U-shape association among participants unhealthy at baseline was seen (fully adjusted hazard ratios for no absence and high absence compared with moderate absence were 1.86 [95% CI=0.9, 3.8] and 1.25 [95% CI=0.7, 2.4], respectively). In the same unhealthy group, incidence of serious coronary events gradually increased as the medically certified absence rate increased (fully adjusted hazard ratios for moderate and high absence compared with no absence were 1.24 [95% CI=0.7, 2.4] and 1.66 [95% CI=0.8, 3.4], respectively). Most of the employees with no or moderate absence days belonged to the group with no medically certified periods of absence.

Comparison of conventional coronary risk factors between unhealthy men with absence days and unhealthy men without absence days shows no differences by age, hypertension, cholesterol concentration, obesity, baseline coronary heart disease (not myocardial infarction), heavy drinking, and effort-reward imbalance. Compared with those who took absence days, those with no absence more often were in the administrative grade (63% vs 31%, $P<.001$), were classified as type A personality (54% vs 41%, $P<.001$), and had higher job demands (47% vs 33%, $P<.001$). They were less likely to have poor job control (22% vs 44%, $P<.001$) or to be smokers (13% vs 19%, $P=.01$). Only differences in grade and job control remained statistically significant ($P<.01$) in a model including all coronary risk factors.

DISCUSSION

This prospective study of male British civil servants demonstrates that employees with no sickness absenteeism fall into 2 groups: healthy individuals who have the lowest risk of serious coronary events and unhealthy ones who have a higher incidence of coronary events than is found among their un-

healthy colleagues with moderate levels of absence. The specific strengths of our investigation were the use of reliable absence, morbidity, and mortality records; the determination of absence levels over a long period of employment; and the ability to control for a large set of potential confounding factors.

The fact that the incidence of serious coronary events is twice as high among unhealthy employees with no sickness absenteeism as among unhealthy employees with moderate levels of sickness absenteeism probably reflects the adverse consequences of working while ill—that is, sickness presenteeism. Confounding by other predictors of serious coronary events can never be entirely excluded in observational studies, but it is unlikely as an explanation of our results. This is because the excess risk of presenteeism remained unchanged after we controlled for baseline differences in demographic, behavioral, biological, and psychosocial coronary risk factors and prevalent coronary heart disease. Indeed, a key potential confounder, low employment grade, as an indicator of low socioeconomic position, was less prevalent among those with sickness presenteeism. Assessment of baseline health was based on self-rated health status and psychological distress, measures that are predictive of all-cause mortality and incidence of coronary heart disease in the Whitehall II cohort.^{3,18}

These findings raise an important question: which of the sickness absenteeism indicators has a protective effect on health? Our findings show that the difference between unhealthy employees with no absence and those with moderate levels of absence was almost exclusively in terms of short periods of absence (≤ 7 days). Medically certified periods (> 7 days) accounted for less than 5% of the absence periods among employees with a moderate number of absence days. Unsurprisingly, a stratified analysis of employees unhealthy at baseline showed a U-shaped association between absence and subsequent serious coronary events for short absences but a linear association for medically certified absences.

Mechanisms that might contribute to the association between presenteeism and increased serious coronary events include the following. First, working while ill may produce a cumula-

tive psychological burden with pathophysiological consequences for the development of coronary heart disease, consistent with the allostasis load hypothesis.^{9,19} Second, working while ill may induce acute stressors that act on preexisting or subclinical vascular disease. One example might involve acute stressors that lower the arrhythmic threshold and trigger myocardial ischemia.^{20,21} Third, sickness presenteeism may be part of a lifestyle in which symptoms of ill health are ignored and medical care not sought.⁸

Recent studies using the Whitehall II cohort and Finnish municipal personnel have shown greater total and cardiovascular mortality for employees with high levels of medically certified absence.^{3,4} The classic study of British post office staff in 1972 through 1975 reported that increasing duration of medically certified absences was associated with increasing “medical wastage” (a term used to describe all deaths in service among those aged younger than 60 and medical retirements).¹

The present findings provide further evidence that medically certified sickness absenteeism is an indicator of ill health. We found that the incidence of serious coronary events gradually increased as the medically certified absence rate increased. Employees with more than one certified period of absence over 3 years had an incidence of serious coronary events almost twice that of employees with no such periods. Conventional coronary risk factors may partially explain this association, as the excess coronary incidence among high-absence participants was attenuated and lost statistical significance after adjustment for these factors. Employees with sickness presenteeism were a small proportion (8%) of those taking no medically certified absence, and their increased risk of coronary event had little effect on the overall linear trend between medically certified periods and coronary events.

Study Limitations

Since there were only 62 serious coronary events among unhealthy men in this study, we acknowledge that our findings need to be validated in further studies with larger samples and longer follow-ups. Such replication would help to determine the generalizability of the present findings—whether they also apply to women, to other sectors of work life, and separately to inci-

dence of nonfatal myocardial infarction and incidence of fatal coronary heart disease.

Conclusions

The present study of male civil servants revealed an increased risk of serious coronary events among unhealthy, distressed employees who failed to take sick leave. This risk was not explained by baseline differences in conventional coronary risk factors, but it seemed to relate to lack of short-term periods of absence. Employers and employees should be aware of the potential harmful effects caused by sickness presenteeism. ■

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Contributors

All of the authors designed the hypothesis, analysed the data, and wrote the article. M. G. Marmot is the director of the Whitehall II study.

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Human Participant Protection

The University College London Medical School committee on the ethics of human research gave approval for the Whitehall II study.

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